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Alexithymia and Mood: Recognition of Emotion in Self and Others

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Abstract

Alexithymia , a trait characterised by a difficulty identifying and describing feelings as well as an externally oriented thinking style, has been found to be associated with both mood and social difficulties. The potential bases of such associations were explored in the present study. The sample consisted of 102 university (primarily psychology) students (13 males, 89 females) aged 18 to 50 years (M = 22.18 years). Participants completed the Toronto Alexithymia Scale (TAS-20), Negative Mood Regulation Scale (NMRS), Depression Anxiety Stress Scales (DASS-21), Reading the Mind in the Eyes Test (RMET), Interpersonal Reactivity Index (IRI) and Alcohol Use Disorders Identification Test (AUDIT). Results were consistent with previous findings of positive relationships of TAS-20 with both AUDIT and DASS-21 and a negative relationship with NMRS. Predicted negative associations of the overall TAS-20 and the externally oriented thinking (EOT) subscale with both RMET and the empathic concern (EC) subscale of the IRI were supported. NMRS fully mediated the relationship between TAS-20 and DASS-21. Hierarchical linear regressions revealed that, after controlling for other relevant variables, the EOT subscale of the TAS-20 predicted RMET and EC. The EOT facet of alexithymia thus appears to be associated with diminished facial recognition of emotions as well as reduced emotional empathy. The negative moods associated with alexithymia appear to be linked to subjective difficulties in self-regulation of emotions.

Keywords: alexithymia, negative mood, negative mood regulation expectancies, facial emotion recognition, empathy, alcohol consumption

Alexithymia and Negative Mood: Recognition of Emotion in Self and Others

1. Introduction

Alexithymia is defined by difficulty identifying and describing feelings, difficulty differentiating between feelings and bodily sensations, restricted imagination, and an externally oriented thinking style (Taylor & Bagby, 2000). Evidence suggests that the etiology of alexithymia involves developmental, biological and psychological factors (e.g., Jorgensen, Zachariae, Skytthe, & Kyvik, 2007; Thorberg, Young, Sullivan & Lyvers, 2010). Worldwide, the prevalence rate of alexithymia in adults within the general population is reported at 5-13% (Franz et al., 2008; Mattila, Salminen, Nummi, & Joukamaa, 2006), and is even higher in clinical samples at 40-67% (Lyvers, Hinton et al., 2014; Thorberg, Young, Sullivan & Lyvers, 2009). Several studies have reported that alexithymia is associated with deficits in the ability to recognise and label facial expressions of both positive and negative emotions, which may be linked to problems with empathy, an inability to take others'perspective (Bird et al., 2010; Cook, Brewer, Shah, & Bird, 2013; Demers & Koven, 2015; Grynberg et al., 2012; Prkachin, Casey, & Prkachin, 2009).

Alexithymia is frequently associated with negative mood states such as depression (Foran & O'Leary, 2013) and anxiety (Onur, Alkm, Sheridan, & Wise, 2013), suggesting that those with alexithymia experience difficulties in self-regulation of negative moods. The Negative Mood Regulation Scale (NMRS; Catanzaro & Mearns, 1990) was designed to assess the strength of an individual's belief in being able to use effective cognitive and behavioural coping strategies for the regulation of negative emotions. Lyvers, Makin, Toms, Thorberg and Samios (2013) assessed alexithymia via the Toronto Alexithymia Scale (TAS-20; Bagby, Parker, & Taylor, 1994) in 153 university students and found significant negative relationships between TAS-20 scores and NMRS as well as trait mindfulness as measured by the Mindful Attention Awareness Scale (Brown & Ryan, 2003), with significant positive

associations of TAS-20 with depression, anxiety and stress as measured by the Depression Anxiety Stress Scales (DASS-21; Lovibond & Lovibond, 1995) and with everyday signs of frontal lobe dysfunction as measured by the Frontal Systems Behavior Scale (FrSBe; Grace & Malloy, 2001). These results suggested that those who scored higher on the TAS-20 index of alexithymia were relatively more impaired in their ability to objectively evaluate and regulate their own negative moods, perhaps due to inherent deficits in prefrontal cortical functioning. As an extension to these findings, the present study administered the TAS-20, DASS-21 and NMRS to test the hypothesis that impaired emotional self-regulation as indexed by NMRS would be an underlying mechanism of the relationship between TAS-20 and DASS-21, and thus a mediator of the association between alexithymia and negative moods, reflecting a lack of effective emotion regulation strategies.

The ability to identify and describe one's own emotional states should logically extend to the ability to detect and relate to the emotions of others (although see Dimaggio et al., 2008). The face, and in particular the eye region, plays an important role in the display of emotions (Parker, Taylor, & Bagby, 1993). Parker et al. assessed 216 Canadian university students for alexithymia using the TAS-20; students were also asked to identify the emotions expressed in black-and-white photographs of faces. Students with high levels of alexithymia were found to perform significantly worse than those with low levels for seven out of nine basic emotions. Similarly Lane et al. (2000) found significant negative correlations between alexithymia scores and the ability to recognise facial expressions of both positive and negative basic emotions. More recently, Prakachin, Casey, and Prakachin (2009) found significant negative associations between alexithymia and recognition of facial expressions of basic emotions including sadness, anger and fear. Surprisingly, those with high levels of alexithymia were found to make facial emotion recognition errors such as misidentifying positive emotions for negative ones (e.g., reporting happiness as fear). Importantly, these

findings suggest that those with high levels of alexithymia may tend to misread other people's emotions and fail to respond appropriately perhaps leading to social difficulties.

The Reading the Mind in the Eyes Test (RMET; Baron-Cohen, Wheelwright, Hill, Raste & Plumb, 2001) was formulated to assess one's ability to attribute affective states of another person, and was administered in the present study given previous reports of emotional facial recognition impairments in alexithymia (Demers & Koven, 2015; Grynberg et al., 2012). RMET performance has also been reported to be impaired in alcohol dependence (Maurage et al., 2011), a disorder in which over half of sufferers have high levels of alexithymia (Thorberg, Young, Sullivan & Lyvers, 2009). Clients undergoing residential treatment for a wide range of substance use disorders were recently found to show high TAS-20 alexithymia scores (Lyvers, Hinton et al., 2014) as well as elevated signs of frontal lobe dysfunction as indexed by the FrSBe. In young adults, higher scores on the TAS-20 index of alexithymia are associated with heavier and riskier alcohol consumption (e.g., Lyvers, Onuoha, Thorberg & Samios, 2012), suggesting that alexithymia is a risk factor for problematic drinking. However, Maurage et al. found that in a sample of patients diagnosed with alcohol dependence, impairment in RMET performance was not related to alexithymia or other trait factors, and thus was attributed to chronic heavy drinking. For this reason, alcohol use was taken into account in the present study, which administered the TAS-20 and the RMET to determine whether TAS-20 predicted RMET scores independent of alcohol in a non-clinical sample. The Alcohol Use Disorders Identification Test (AUDIT; Babor, Higgins-Biddle, Saunders, & Monteiro, 1992) was administered as an index of risky or problematic drinking.

A further question asked by the present study was whether deficits in facial emotion recognition associated with alexithymia might account for deficient emotional empathy among those scoring high on the TAS-20. Previous research has indicated emotional empathy

deficits in alexithymia (Grynberg et al., 2010). As in the Grynberg et al. study the present study assessed empathy by administering the Interpersonal Reactivity Index (IRI; Davis, 1994), which measures both cognitive and emotional aspects of empathy. Of primary interest in the present context was the Empathic Concern (EC) subscale as an index of emotional empathy. Recently Demers and Koven (2015) reported that the Externally Oriented Thinking (EOT) subscale of the TAS-20 uniquely predicted variance in facial emotion recognition as measured by RMET as well as an index of emotional empathy, hence the present investigation examined relationships of TAS-20 subscales to both EC and RMET, with particular focus on the EOT subscale. Demers and Koven proposed that high scores on EOT reflect inherently poor metacognitive ability to represent one's own subjective states as well as those of others, leading to deficiencies in both emotion recognition and emotional empathy. However an alternative possibility is that empathy deficits related to alexithymia (particularly the EOT facet) may be mediated by deficits in facial emotion recognition. In other words, to emotionally empathize with others one must be able to identify the emotions of others in the first place, so a deficit in the latter should logically produce a deficit in the former.

Based on the previous research cited above, we expected to find positive associations of TAS-20 scores with both DASS-21 and AUDIT, and a negative relationship with NMRS. The relationship between TAS-20 and negative mood as assessed by DASS-21 was expected to be fully mediated by NMRS, based on the notion that alexithymia is associated with inherent mood regulation difficulties. Further, we predicted that TAS-20 scores, and EOT subscale scores in particular, would be negatively related to both RMET and the EC subscale of the IRI even after controlling for other factors, given the findings recently reported by Demers and Koven (2015). Finally, the predicted negative relationship of EOT with EC was expected to be mediated by RMET.

2. Method

2.1. Participants

Initially 109 (primarily psychology) students, all of whom were social drinkers, were recruited on the campus of Bond University. Mahalanobis distance indicated 7 multivariate outliers. Removing these from the dataset resulted in a total of 102 cases (13 males, 89 females) aged 18 to 50 years (M = 22.18 years) suitable for statistical analyses.

2.2. Materials

2.2.1. Demographics. This questionnaire collected information on participants age, gender, country of origin, education, and substance use.

2.2.2. Negative Mood Regulation Scale (NMRS; Catanzaro & Mearns, 1990). The NMRS is a 30-item scale that measures beliefs in being able to use effective cognitive and behavioural strategies for the regulation of negative emotions (Catanzaro & Mearns, 1990). Items assess strategies to alleviate negative mood including cognitive (e.g., "*I'll feel better when I understand why I feel bad*"), social (e.g., "*Going out to dinner with friends will help*"), and solitary (e.g., "*Catching up with my work will help me calm down*"), and beliefs that negative moods can or cannot be alleviated (e.g., "*I can usually find a way to cheer myself up*"). All items begin with the same stem "*When I'm upset, I believe that…*". Items are rated on a five point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Possible scores range from 30 to 150, with higher scores indicating greater belief in one's ability to regulate negative emotions.

2.2.3. Toronto Alexithymia Scale (TAS-20; Bagby, Parker & Taylor, 1994). The TAS-20 is a 20-item questionnaire measuring levels of alexithymia. Seven items address Difficulty Identifying Feelings (e.g., "*I am often confused about what emotion I am feeling*"); five items address Difficulty Describing Feelings (e.g., "*It is difficult for me to find the right words for my feelings*"); and eight items address Externally Oriented Thinking (e.g., "*I prefer*

to analyze problems rather than just describe them"). Items are rated on a five-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Possible scores range from 20 to 100, with higher scores indicating greater levels of alexithymia.

2.2.4. Reading the Mind in the Eyes Test - Revised (RMET; Baron-Cohen et al., 2001). The RMET is a 36-item measure containing black-and white photographs of the eye region of faces that depict complex emotional expressions and includes an equal number of male and female eye gaze photographs. The RMET assesses the ability to attribute emotional states of others as expressed through facial eye gazes. Each photograph is shown separately and is surrounded by four emotion words, one of which is the target emotion. Emotional states include a mixture of positive items (e.g., "relaxed"), negative items (e.g., "irritated"), and neutral items (e.g., "reflective"). Correct target words are scored as 1 and incorrect foils scored as 0. Possible scores range from 0 to 36, with higher scores indicating greater ability to detect facial expressions of emotion.

2.2.5. Interpersonal Reactivity Index (IRI; Davis, 1994). The IRI is a 28-item self-report scale that assesses cognitive and emotional aspects of empathy. There are four subscales, a seven-item perspective-taking scale (PT; e.g., "*I try to look at everybody's side of a disagreement before I make a decision*"); a seven-item fantasy scale (FS; e.g., "*I really get involved with the feelings of the characters in a novel*"); a seven-item empathic concern scale (EC; e.g., "*I often have tender, concerned feelings for people less fortunate than me*"); and a seven-item personal distress scale (PD; e.g., "*being in a tense emotional situation scares me*") . Items are rated on a five point Likert scale ranging from 0 (*A: does not describe me well*) to 4 (*E: describes me very well*). The EC scale was of primary interest as an index of emotional empathy.

2.2.6. Alcohol Use Disorders Identification Test (AUDIT; Babor et al., 1992). The AUDIT is a 10-item self-report measure that screens for risky alcohol use. Items include

three items measuring alcohol consumption (e.g., "*How many standard drinks do you have on a typical day when you are drinking*"), three items measuring alcohol dependence (e.g., "*How often during the last year have you failed to do what was normally expected of you because of drinking*"); and four questions measuring alcohol-related problems (e.g., "*Have you or someone else been injured because of your drinking?*"). Items are scored on a four-point scale such that possible total scores range from 0 to 40 with higher scores indicating more hazardous drinking.

2.2.7. Depression Anxiety Stress Scales (DASS-21; Lovibond & Lovibond, 1995). The DASS is a 21-item self-report measure that assesses depression, anxiety, and stress. Participants are asked to respond to items by rating the degree to which they experienced each symptom over the past week. Each subscale, Depression (e.g., "*I couldn't seem to experience any positive feelings at all*"), Anxiety (e.g., *"I felt I was close to panic"*), and Stress (e.g., *"I found it difficult to relax"*), has seven items measured on a four-point Likert scale ranging from 0 (*Did not apply to me at all*) to 3 (*Applied to me very much, or most of the time*). Possible scores range from 0 to 63, with higher scores indicating higher levels of negative mood.

2.3. Procedure

The research was conducted in accordance with approval obtained from the university ethics committee. The online survey was created using software provided by Qualtrics.com. Student participants were recruited from the Bond University online psychology research participant pool, advertisements in the student daily digest emails, and distribution of flyers. Prospective participants were provided with a hyperlink that directed them to an explanatory statement inviting them to participate in a survey exploring personality, mood, alcohol consumption and visual emotion recognition. The explanatory statement indicated that participation was voluntary, responses were anonymous, and they had the right to withdraw

at any time without providing a reason. Participants were informed that the survey would take approximately 40 minutes to complete, that they would be eligible to participate if they were aged 18 years or older, were social drinkers and had normal or corrected-to-normal vision. To encourage participation, undergraduate psychology students were informed that they would be granted 1% course credit, and non-psychology students were given the chance to enter a random draw to win a $50 gift card.

3. Results

Table 1 shows the descriptive statistics and Cronbach alphas for the measures of primary interest in this sample. Consistent with previous research cited above, 14% of the present sample scored as having clinical levels of alexithymia by TAS-20 cutoff (i.e., > 61; Bagby, Taylor & Parker, 1994). There was no relationship between gender and alexithymia in the present sample, $p = .84$.

Table 1.

Descriptive Statistics and Internal Consistencies for the Primary Measures ($N = 102$).

Measure	No. of Items	*M*	*SD*	α[a]
NMRS	30	110.90	(12.13)	.84
TAS-20	20	46.66	(11.89)	.88
DIF	7	14.69	(5.73)	.87
DDF	5	13.00	(4.48)	.81
EOT	8	18.95	(18.95)	.73
RMET	36	26.68	(4.16)	.65
IRI	28	65.80	(11.77)	.81
DASS	21	4.48	(2.01)	.91
AUDIT	10	9.19	(5.19)	.81

[a]Cronbach Alpha Reliability Coefficient

3.1. Correlations

DASS-21 scores were moderately positively skewed, thus a square-root transformation was applied. Pearson's correlations were calculated to assess relationships between the variables of interest (see Table 2). TAS-20 total scores were significantly negatively correlated with age and with scores on the NMRS, RMET, and IRI-EC subscale as predicted. The TAS-20 was significantly positively correlated with all DASS-21 subscales and AUDIT scores, also as expected. The TAS-20 subscales showed mostly similar relationships, however only EOT was significantly related to RMET performance and AUDIT scores.

3.2. Path Analysis on NMRS

Based on theoretical considerations, negative mood regulation strategies as indexed by NMRS were hypothesised to mediate the relationship of TAS-20 to negative mood as indexed by DASS-21 total scores. Prior to running the path analysis, the assumptions for mediation were assessed (Baron & Kenny, 1986). First, a significant relationship was found between the predictor variable TAS-20 and the dependent variable DASS-21, $F(1, 100) = 13.06$, $p < .001$, accounting for 12% of the variance. Second, a significant relationship was found between the predictor variable TAS-20 and the mediator NMRS, $F(1, 100) = 61.75$, $p < .001$, accounting for 38% of the variance. Third, a hierarchical multiple regression with NMRS (Step 1) and NMRS and TAS-20 (Step 2) found a significant relationship at step 1 between the mediator NMRS and dependent variable DASS-21, $F(1, 100) = 34.01$, $p < .001$, accounting for 25% of the variance. At Step 2, with NMRS and TAS-20 as predictors, TAS-20 was no longer significant, $F(2, 99) = 16.95$, $p = .675$, and did not add significantly to the variance explained ($\Delta R2 = .00$). Only NMRS ($\beta = -.48$, $p < .001$) showed univariate significance. As all four conditions were met, these findings indicated that NMRS fully mediated the relationship between TAS-20 scores and DASS-21 scores. A Sobel test confirmed full mediation, $Z = 3.83$, $p < .001$, as illustrated in Figure 1.

Table 2.

Intercorrelations among study variables (see text for definitions).

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Age														
2	TAS-Total	-.32**													
3	TAS-DIF	-.23*	.80***												
4	TAS-DDF	-.26**	.83***	.49***											
5	TAS-EOT	-.28**	.77***	.35***	.57***										
6	DASS-Anx	-.12	.38***	.56***	.23*	.06									
7	DASS-Dep	-.07	.37***	.47***	.26**	.12	.57***								
8	DASS-Str	.10	.28**	.39***	.24*	.01	.62***	.69***							
9	AUDIT-Tot	-.25*	.21*	.04	.17	.32**	.17	.11	.08						
10	NMRS-Tot	-.22*	-.62***	-.57***	-.52***	-.38***	-.42***	-.57***	-.40***	-.13					
11	IRI-PT-Sub	.18	-.40***	-.23*	-.36***	-.40***	-.04	-.12	-.02	-.06	.44***				
12	IRI-FS-Sub	-.03	-.11	.13	-.13	-.32**	.09	.00	-.12	-.01	.04	.25*			
13	IRI-EC-Sub	.11	-.38***	-.22*	-.34***	-.37***	-.10	-.11	-.08	-.13	.30**	.49***	.34***		
14	IRI-PD-Sub	-.18	.31**	.27**	.25*	.21*	.12	.14	.18	.28**	-.48***	-.29**	.07	.03	
15	RMET-Tot	.21*	-.20	-.14	-.07	-.28**	.05	.08	.16	-.03	.08	.22*	.18	.12	-.11

Note: *p < .05; **p < .01; ***p < .001

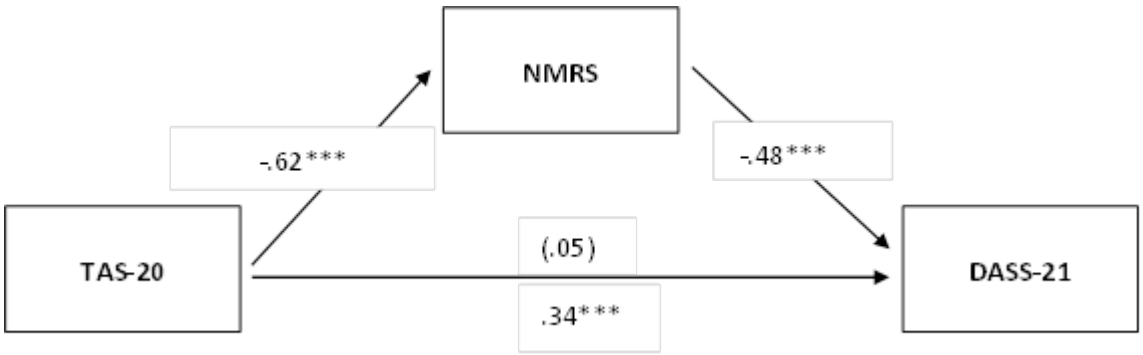

Figure 1. NMRS mediates the relationship between TAS-20 and DASS-21 total scores. All values are standardized regression weights. ***$p < .001$

3.3. Hierarchical Multiple Regression on RMET

To test the hypothesis that facial emotion recognition would be impaired in participants with higher TAS-20 (especially EOT; Demers & Koven, 2015) scores after controlling for age, gender, alcohol consumption, and negative mood states, a hierarchical multiple regression analysis was employed. Predictor variables were entered in the order of age and gender (step 1); AUDIT (step 2); DASS-21 (step 3); and TAS-20 subscales; DIF, DDF and EOT (step 4), with RMET as the criterion variable. At step 1, the model was not significant, $F(2, 98) = 2.93$, $p = .06$, with age and gender accounting for 6% of the variance in RMET, $R = .24$. At step 2, the addition of AUDIT did not significantly improve prediction of RMET, $R = .24$, *F change* $(1, 97) < 1$, resulting in a non-significant model, $F(3, 97) = 1.93$, $p = .13$. At step 3, the addition of DASS-21 did not significantly improve prediction of RMET, $R = .26$, *F change* $(1, 96) = 1.20$, $p = .28$, accounting for an additional 7% of variance and retaining a non-significant model, $F(4, 96) = 1.75$, $p = .15$. At step 4, the addition of TAS-20 subscales significantly improved prediction of RMET, $R = .39$, *F change* $(3, 93) = 3.19$, $p = .03$, accounting for an additional 16% of variance and resulting in a significant model, $F(7, 93) = 2.44$, $p = .02$. When all variables were combined in model 4, EOT ($p = .02$) emerged as the only significant predictor of unique variance in RMET performance. Unstandardized (B) and

standardised (β) regression coefficients and ΔR^2 for each step of the hierarchical multiple regression analysis are reported in Table 3.

Table 3.

Age, Gender, Alcohol Use Disorders Identification Test (AUDIT), DASS-21, and Toronto Alexithymia Scale (TAS-20) Subscales as Predictors of RMET Score

	Variable	B	β	*t*	R^2 Change
Step 1	(Constant)	25.86		9.12	.06*
	Age	.15	.21	2.18*	
	Gender	-1.38	-.11	-1.09	
Step 2	(Constant)	25.77		7.97	.00
	Age	.15	.22	2.12	
	Gender	-1.36	-.11	-1.06	
	AUDIT	.01	.01	.08	
Step 3	(Constant)	25.33		7.79	.01
	Age	.15	.21	2.09*	
	Gender	-1.36	-.11	-1.06	
	AUDIT	-.01	-.01	-.07	
	DASS-21	.03	.11	1.10	
Step 4	(Constant)	30.81		8.15	.09*
	Age	.10	.14	1.38	
	Gender	-1.43	-.11	-1.15	
	AUDIT	.03	.04	.38	
	DASS-21	.04	.17	1.44	
	TAS-DIF	-.13	-.18	-1.35	
	TAS-DDF	.16	.17	1.33	
	TAS-EOT	-.27	-.30	-2.41*	

* $p < .05$

3.4. Regression on Empathic Concern

To test the hypothesis that emotional empathy as indexed by the EC scale of the IRI would be negatively related to TAS-20 (especially EOT) scores after controlling for age, gender, alcohol consumption and negative mood states, a hierarchical multiple regression analysis was employed. Predictor variables were entered in the order of age and gender (step 1); AUDIT (step 2); DASS-21 total scores (step 3); and TAS-20-DIF, DDF and EOT (step 4), with EC as the criterion variable. At step 1, the model was not significant, $F(2, 99) = 1.63$, $p = .20$, with age and gender accounting for 3% of the variance in EC, $R = .18$. At step 2, the addition of AUDIT did not significantly improve the prediction of EC, $R = .20$, *F change* $(1, 98) < 1$, accounting for an additional 4% of variance and resulting in a non-significant model, $F(3, 98) = 1.32$, $p = .27$. At step 3, the addition of DASS-21 did not significantly improve the prediction of EC, $R = .22$, *F change* $(1, 97) < 1$, accounting for an additional 5% of variance and retaining a non-significant model, $F(4, 97) = 1.18$, $p = .33$. Only with the addition of the TAS-20 subscales at step 4 did the model become significant, $R = .43$, *F change* $(3, 94) = 5.21$, $p = .002$, accounting for an additional 18% of variance and resulting in a significant model, $F(7, 94) = 3.00$, $p = .007$.When all variables were combined in model 5, only EOT ($p = .04$) predicted unique variance in EC. Unstandardized (B) and standardised (β) regression coefficients and ΔR^2 for each step of the hierarchical multiple regression analysis are reported in Table 4.

Table 4.

Age, Gender, Alcohol Use Disorders Identification Test (AUDIT), DASS-21, and Toronto Alexithymia Scale (TAS-20) Subscales as Predictors of Empathic Concern.

	Variable	B	β	*t*	R^2 Change
Step 1	(Constant)	13.55		4.65	.03
	Age	.08	.10	1.02	
	Gender	1.88	.14	1.45	
Step 2	(Constant)	14.88		4.50	.01
	Age	.06	.08	.78	
	Gender	1.72	.13	1.32	
	AUDIT	-.07	-.11	1.03	
Step 3	(Constant)	15.35		4.57	.01
	Age	.06	.08	.80	
	Gender	1.67	.13	1.23	
	AUDIT	-.06	-.08	-.73	
	DASS-21	-.02	-.09	-.87	
Step 4	(Constant)	23.42		6.17	.14**
	Age	-.02	-.03	-.25	
	Gender	1.66	.13	1.34	
	AUDIT	.00	.00	-.00	
	DASS-21	-.00	-.01	-.06	
	TAS-DIF	-.04	-.05	-.38	
	TAS-DDF	-.17	-.17	-1.39	
	TAS-EOT	-.24	-.26	-2.11*	

*$p < .05$ **$p < .01$

4. Discussion

As predicted, total TAS-20 alexithymia scores were significantly negatively correlated with negative mood regulation expectancies (NMRS), ability to detect emotions via eye gaze (RMET), and emotional empathy (EC). TAS-20 was significantly positively correlated with alcohol consumption (AUDIT) and negative moods (DASS-21) as in previous work (e.g., Lyvers et al., 2012, 2014; Thorberg et al., 2010). NMRS fully mediated the

relationship between TAS-20 and DASS-21, indicating that the negative moods associated with alexithymia are tied to deficits in emotional self-regulation. The finding that the EOT subscale of the TAS-20, but not the other two subscales, was a unique negative predictor of both RMET and a measure of emotional empathy supports the recent findings of Demers and Koven (2015), though they used a different index of emotional empathy.

Importantly, the EOT subscale of the TAS-20 was a unique negative predictor of facial emotion recognition on the RMET even after controlling for age, gender, alcohol consumption, and negative moods. This result seems contrary to the findings of Maurage et al. (2011) who found that the poorer RMET performance of alcoholics compared to controls could not be attributed to alexithymia despite the significantly higher TAS-20 alexithymia scores of their alcohol-dependent sample. However the present study used a non-clinical sample, hence the results are not comparable to their findings in alcohol-dependent patients. In the present non-clinical sample, EOT scores negatively predicted RMET performance even after alcohol use was taken into account. Further, the present study found that of the three TAS-20 subscales only EOT was a unique predictor of RMET performance. In the present study EOT was also a significant negative predictor of scores on the IRI-EC subscale, which Davis (1994) has described as an affective measure of empathy, even after controlling for age, gender, alcohol consumption, and negative moods. Although the EOT subscale of the TAS-20 was of special interest in the present context given the recent findings of Demers and Koven (2015), both the DDF and DIF subscales were also negatively related to EC in the present study. Further, EOT was negatively related to the PT and FS subscales of the IRI as well. Given that EOT scores were negatively related to both RMET and EC in the present study, perhaps the negative relationship between EOT scores and emotional empathy as indexed by EC was secondary to the deficient facial recognition of emotions, as indexed by RMET, which was also associated with EOT. However, contrary to that interpretation RMET

and EC were uncorrelated in the present study, suggesting that a more fundamental deficit in emotion processing may underlie the negative relationship between alexithymia and emotional empathy – as recently proposed by Demers and Koven (2015) in the context of similar findings.

The present study contained several limitations. The cross-sectional nature of the study limits interpretation of the findings, as the correlational design does not allow causation to be inferred. Furthermore, given the prevalence of female students in psychology programs today, the current sample was mainly female and may not generalize to samples that are more balanced in gender. Future research should thus recruit larger and more representative samples to replicate the present findings. Nevertheless most predictions were supported, consistent with current theoretical interpretations of alexithymia and its facets. The present findings, like those of Demers and Koven (2015), point to special relevance of the EOT facet of alexithymia for both facial emotion recognition and emotional empathy. Demers and Koven proposed that high EOT scores reflect a fundamental deficit in metacognition which in turn leads to deficits in both emotion recognition and emotional empathy. Further research on the nature of these relationships is clearly warranted.

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